chromosome 10

Humans normally have 46 chromosomes in each cell, divided into 23 pairs. Two copies of chromosome 10, one copy inherited from each parent, form one of the pairs. Chromosome 10 spans more than 135 million DNA building blocks (base pairs) and represents between 4 and 4.5 percent of the total DNA in cells.

Identifying genes on each chromosome is an active area of genetic research. Because researchers use different approaches to predict the number of genes on each chromosome, the estimated number of genes varies. Chromosome 10 likely contains 700 to 800 genes that provide instructions for making proteins. These proteins perform a variety of different roles in the body.

Health Conditions Related to Chromosomal Changes

The following chromosomal conditions are associated with changes in the structure or number of copies of chromosome 10.

cancers

Changes in the number and structure of chromosome 10 are associated with several types of cancer. For example, a loss of all or part of chromosome 10 is often found in brain tumors called gliomas, particularly in aggressive, fast-growing gliomas. The association of cancerous tumors with a loss of chromosome 10 suggests that some genes on this chromosome play critical roles in controlling the growth and division of cells. Without these genes, cells could grow and divide too quickly or in an uncontrolled way, resulting in cancer. Researchers are working to identify the specific genes on chromosome 10 that may be involved in the development and progression of gliomas.

A complex rearrangement (translocation) of genetic material between chromosomes 10 and 11 is associated with several types of blood cancer known as leukemias. This chromosomal abnormality is found only in cancer cells. It fuses part of a specific gene from chromosome 11 (the *MLL* gene) with part of another gene from chromosome 10 (the *MLLT10* gene). The abnormal protein produced from this fused gene signals cells to divide without control or order, leading to the development of cancer.

Crohn disease

Variations in a particular region of chromosome 10 have been associated with the risk of developing Crohn disease. These genetic changes are located on the long (q) arm of the chromosome at a position designated 10q21.1. Researchers refer to this part of chromosome 10 as a "gene desert" because it contains no known genes.

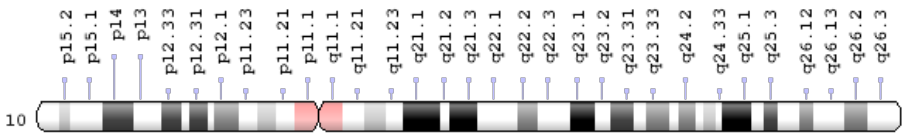
However, it may contain stretches of DNA that help regulate nearby genes such as *ERG2*. This gene has a potential role in immune system function, and researchers are interested in studying the gene further to determine whether it is associated with Crohn disease risk.

other chromosomal conditions

Other changes in the number or structure of chromosome 10 can have a variety of effects. Intellectual disability, delayed growth and development, distinctive facial features, and heart defects are common features. Changes to chromosome 10 include an extra piece of the chromosome in each cell (partial trisomy), a missing segment of the chromosome in each cell (partial monosomy), and an abnormal structure called a ring chromosome 10. Ring chromosomes occur when a chromosome breaks in two places and the ends of the chromosome arms fuse together to form a circular structure. Rearrangements (translocations) of genetic material between chromosomes can also lead to extra or missing material from chromosome 10.

Chromosome Diagram

Geneticists use diagrams called idiograms as a standard representation for chromosomes. Idiograms show a chromosome's relative size and its banding pattern, which is the characteristic pattern of dark and light bands that appears when a chromosome is stained with a chemical solution and then viewed under a microscope. These bands are used to describe the location of genes on each chromosome.



Credit: Genome Decoration Page/NCBI

Additional Information & Resources

MedlinePlus

- Encyclopedia: Chromosome
  https://medlineplus.gov/ency/article/002327.htm

Additional NIH Resources

- National Human Genome Research Institute: Chromosome Abnormalities
  https://www.genome.gov/11508982/

Educational Resources

- Genome News Network: Human Chromosomes 9 and 10 Are Complete (May 26, 2004)
  http://www.genomenewsnetwork.org/articles/2004/05/26/chromosomes.php

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Chromosomes,+Human,+Pair+10%5BMAJR%5D%29+AND+%28Chromosome+10%5BTI%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D

OMIM

- CHROMOSOME 10q26 DELETION SYNDROME
  http://omim.org/entry/609625
- GLIOMA SUSCEPTIBILITY 1
  http://omim.org/entry/137800
- MYELOID/LYMPHOID OR MIXED LINEAGE LEUKEMIA, TRANSLOCATED TO, 10
  http://omim.org/entry/602409

Sources for This Summary

- Deloukas P, Earthrowl ME, Grafham DV, Rubenfield M, French L, Steward CA, Sims SK, Jones MC, Searle S, Scott C, Howe K, Hunt SE, Andrews TD, Gilbert JG, Swarbreck D, Ashurst JL, Taylor A, Battles J, Bird CP, Ainscough R, Almeida JP, Ashwell RI, Ambrose KD, Babbage AK, Bagguley CL, Bailey J, Banerjee R, Bates K, Beasley H, Bray-Allen S, Brown AJ, Brown JY, Burford DC, Burrill W, Burton J, Cahill P, Camire D, Carter NP, Chapman JC, Clark SY, Clarke G, Clee CM, Clegg S, Corby N, Coulson A, Dhami P, Dutta I, Dunn M, Faulkner L, Frankish A, Frankland JA, Garner P, Garnett J, Gribble S, Griffiths C, Grocock R, Gustafson E, Hammond S, Harley JL, Hart E, Heath PD, Ho TP, Hopkins B, Horne J, Howden PJ, Huckle E, Hynds C, Johnson C, Johnson D, Kana A, Kay M, Kimberley AM, Kershaw JK, Kokkinaki M, Laird GK, Lawlor S, Lee HM, Leongamornlert DA, Laird G, Lloyd C, Lloyd DM, Loveland J, Lovell J, McLaren S, McLay KE, McMurray A, Mashreghi-Mohammadi M, Matthews L, Milne S, Nickerson T, Nguyen M, Overton-Larty E, Palmer SA, Pearce AV, Peck AI, Pelan S, Phillimore B, Porter K, Rice CM, Rogosin A, Ross MT, Sarafidou T, Sehra HK, Shownkeen R, Skuce CD, Smith M, Standring L, Sycamore N, Tester J, Thorpe A, Torcasso W, Tracey A, Tromans A, Tsolas J, Wall M, Walsh J, Wang H, Weinstock K, West AP, Willey DL, Whitehead SL, Wilming L, Wray PW, Young L, Chen Y, Lovering RC, Moschonas NK, Siebert R, Fechtel K, Bentley D, Durbin R, Hubbard T, Doucette-Stamm L, Beck S, Smith DR, Rogers J. The DNA sequence and comparative analysis of human chromosome 10. Nature. 2004 May 27;429(6990):375-81.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15164054
- Deloukas P, French L, Meitinger T, Moschonas NK. Report of the third international workshop on human chromosome 10 mapping and sequencing 1999. Cytogenet Cell Genet. 2000;90(1-2):1-12.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/11060438

- Ensembl Human Map View: Chromosome 10
  http://www.ensembl.org/Homo_sapiens/Location/Chromosome?chr=10;r=10:1-133797422
- Gilbert F. Chromosome 10. Genet Test. 2001 Spring;5(1):69-82.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/11336406
- Map Viewer: Genes on Sequence
  https://www.ncbi.nlm.nih.gov/mapview/maps.cgi?O
  RG=human&MAPS=ideogr,ugHs,genes&CHR=10
- Meyer C, Schneider B, Jakob S, Strehl S, Attarbaschi A, Schnittger S, Schoch C, Jansen MW, van Dongen JJ, den Boer ML, Pieters R, Ennas MG, Angelucci E, Koehl U, Greil J, Griesinger F, Zur Stadt U, Eckert C, Szczepanski T, Niggli FK, Schäfer BW, Kempski H, Brady HJ, Zuna J, Trka J, Nigro LL, Biondi A, Delabesse E, Macintyre E, Stanulla M, Schrappe M, Haas OA, Burmeister T, Dingermann T, Klingebiel T, Marschalek R. The MLL recombinome of acute leukemias. Leukemia. 2006 May;20(5):777-84.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16511515
- Ohgaki H, Kleihues P. Genetic pathways to primary and secondary glioblastoma. Am J Pathol. 2007 May;170(5):1445-53. Review.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17456751
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1854940/
- Rasheed BK, Wiltshire RN, Bigner SH, Bigner DD. Molecular pathogenesis of malignant gliomas. Curr Opin Oncol. 1999 May;11(3):162-7. Review.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/10328589
- Rioux JD, Xavier RJ, Taylor KD, Silverberg MS, Goyette P, Huett A, Green T, Kuballa P, Barmada MM, Datta LW, Shugart YY, Griffiths AM, Targan SR, Ippoliti AF, Bernard EJ, Mei L, Nicolae DL, Regueiro M, Schumm LP, Steinhart AH, Rotter JI, Duerr RH, Cho JH, Daly MJ, Brant SR. Genome-wide association study identifies new susceptibility loci for Crohn disease and implicates autophagy in disease pathogenesis. Nat Genet. 2007 May;39(5):596-604. Epub 2007 Apr 15.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17435756
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2757939/
- Scigliano S, Grégoire MJ, Schmitt M, Jonveaux PH, LeHeup B. Terminal deletion of the long arm of chromosome 10. Clin Genet. 2004 Apr;65(4):294-8. Review.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15025722
- UCSC Genome Browser: Statistics
  http://genome.cse.ucsc.edu/goldenPath/stats.html
- Van Limbergen H, Poppe B, Janssens A, De Bock R, De Paepe A, Noens L, Speleman F. Molecular cytogenetic analysis of 10;11 rearrangements in acute myeloid leukemia. Leukemia. 2002 Mar;16(3):344-51. Review.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/11896537
- Waggoner DJ, Chow CK, Dowton SB, Watson MS. Partial monosomy of distal 10q: three new cases and a review. Am J Med Genet. 1999 Sep 3;86(1):1-5. Review.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/10440820

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